d.) Remarks

Regarding **Item 2** of the instant Action, applicant encloses herewith a drawing correction that pertains to Figures 2 and 4. Specifically, applicant has added the reference numeral "25" and lead line to both figures. In Figures 2 and 3 the lead line points to the space occupied by collection pads 42 and 43, which is described in paragraph **[0051]** of the instant application as important elements of the analysis unit 25.

With respect to **Item 3** of the Action, applicant has entered a change on page 14, paragraph [0053], indicating that potassium, not glucose, is the positive ion example.

Concerning **Item 4**, the rejection under §102(b):

The sole reference employed in rejecting claim 3 under 35 USC 102(b) is the Avrahami publication, US 2002/0038101. This patent described apparatus for facilitating transdermal passage of materials such as drugs into the skin and analysis of fluid extracted from the skin. The reference describes the use of a substance storage unit, and electrodes that may be activated to drive some of the substance from the storage unit through the stratum corneum of the epidermis. The publication also mentions the use of a processor to control the application of voltages to the electrodes, and have some kind of communications with a central computer or the like. It also describes some form of fluid analysis to develop data on a body substance level and affect the programmed microprocessor's activation of the electrodes. In these general features, applicant acknowledges that the reference bears some likeness to the instant invention.

A centerpiece of the Avrahami disclosure is the recognition that the stratum corneum epidermis (the superficial layer of the epidermis) demonstrates a significantly higher resistance to the passage of molecules therethrough than does the underlying epidermal tissue. Therefore, Avrahami proposes in paragraph **[0020]** "to form micro-channels in the stratum corneum by ablating the stratum corneum in order to increase conductance of the substance therethrough, and to generally not directly affect or damage epidermal tissue underlying the stratum corneum or in the innervated dermis." Avrahami states in paragraph **[0022]** this is done by "a high-frequency AC current with an optional DC current added thereto is applied between the closely-spaced electrodes in order to generate lateral capacitive currents in the stratum corneum and to cause breakdown and micro-channel formation in the stratum corneum."

And note Avrahami paragraph **[0168]**: "When device 20 drives current through the stratum corneum, this tissue is heated resistively, so that when a sufficient quantity of energy has passed therethrough in a short time period, the tissue is ablated by the total energy dissipated therein. This ablation creates the desired micro-channels, i.e. physical gaps in the tissue. It has been found that application of a current to a small area of the skin leads to formation of such micro-channels, through which even large molecules can pass relatively freely, without the necessity of ionizing or polarizing the

molecules, and without causing pain or substantial trauma to the dermis and epidermal tissue underlying the stratum corneum."

This ablation/microchannel formation technique is the kernel of the Avrahami invention, and the other features appear to have been afterthoughts. For example, Avrahami describes the use of a fluid analysis unit 356 for analyzing almost any biological fluid, yet there is no suggestion as to how the analysis is carried out. The implication is that the analysis unit 356 is an off-the-shelf item that may be dropped onto the custom card, but this is not the situation in the state of the art. Likewise, the analyte analysis unit 372 is not described in any detail, and appears to be a minimal feature.

The present invention comprises a patch that is worn by a person and adhered to the skin and designed to drive a substance through the skin from a storage pad, using a voltage applied to an arrangement of electrodes on the patch. The invention includes an analysis unit 25 that monitors the concentration of a substance in the body. The analysis unit provides concentration signals to a digital data processor that controls the dispensing of the agent into the skin when the concentration is outside of a particular range of concentrations. The battery, programmable digital data processor and the analysis unit are all contained within the patch itself.

In notable contradistinction to the Avrahami reference, the analysis unit 25 of the present invention is described in detail. In paragraphs **[0051]-[0057]**, the present application details the use of reverse iontophoresis to

extract interstitial fluid from the skin, followed by infrared analysis using IR source 47 and IR detector 48 situated between the analysis unit collection pads 42 and 43. Substances in the interstitial fluid such as glucose absorb discrete infrared frequencies, and the frequency absorption patterns for different particular substances, such as glucose, are known to the art and are unique to the particular substance. Thus the infrared intensity data produced by detector 48 for a series of specific infrared frequencies identifies the presence of a substance such as glucose in collection pad 42 and identifies the concentration of the substance in the pad. Detector 48 outputs this data in digital form thereby enabling data processor 34 to analyze the detected data and to enable administration of a corrective dosage of an agent, such as insulin derivative, at one or more of the drug administration sectors 22, 23 and 24 of the patch.

Thus applicant fulfills the requirement of teaching the invention in a manner that enabled one of ordinary skill in the art to make and use the invention. This disclosure is completely absent in the reference, and applicant asserts that the IR analysis unit 25 of the invention is a unique and patentable aspect of the present invention.

Another point of distinction over the reference involves the provision of communications to and from the electrically driven devices for transdermal substance delivery. In Avrahami paragraph **[0229]**, (Fig. 13, for

example), the device establishes contact with another digital device (computer, etc.) through a preferred communications device, which is infrared transducer 366. This form of communications, used most commonly in TV remote control devices, is notoriously dependent on line of sight, and can be defeated by any blocking obstacle, poor lighting conditions (e.g., bright sunlight), and the like. Thus it is inherently limited to short distances, requiring the user to remain close to the IR transceiver. This is a serious drawback to the Avrahami design.

Once again, Avrahami makes a toss-off suggestion in paragraph **[230]** that its device may employ radio frequency communications, but there is no further description of these communications or how they are carried out, nor any disclosure that the radio device is incorporated within the card that embodies the components of that device.

In another notable contradistinction to the Avrahami reference, the present invention provides a robust description of radio communications between the patch and a remote control unit. As detailed in paragraph **[0036]** of the application, the patch 11 features a radio transmitter and receiver 36 located within the patch and connected to the processor 34 to enable input of instructions to the processor from a remote control unit 37. Note that "Remote control unit 37 enables transmission of signals, which are preferably encrypted, to the internal radio transmitter and receiver 36 of

patch 11 for such purposes as selecting a mode of operation of the patch and for programming or reprogramming the timing and duration of successive administrations of a bio-active agent."

As detailed in paragraph **[0037]** of the application, one use for the invention involves soldiers or other individuals who may be at risk of exposure to chemical or biological agent. The patch which is secured to each of these individuals contains one or more antitoxins, vaccines or the like. Upon indication of exposure (or likely exposure) to a chemical or biological malefactor, a central command authority may use the remote unit 37 to send an encrypted radio message to the patches worn by the individuals, activating the patches immediately and simultaneously to deliver an appropriate counteragent to the individuals.

Clearly the use of radio communications is a key factor in enabling this use of the invention in reaching individuals who may be out of line of sight communications. The radio links also enable communicating with a plurality of individual patches virtually simultaneously. Likewise, another key factor is the use of encrypted radio communications, which prevents malicious false actuation of the patches.

The Avrahami publication does not disclose any of these features that are so important to the military/service group use of the invention described above. Avrahami never suggests controlling a plurality of patches on a

group in a risk situation, and activating all the patches through radio communications. And it's lack of teaching concerning radio communications, group communications, or encrypted communications points to the novelty and patentability of this aspect of the invention.

The distinctions of the present invention over the Avrahami reference have been brought to the fore by the changes to the claims of this amendment. Claim 1 has been fortified by the addition of a detailed recitation of the analysis unit, including means for extracting a fluid sample, the IR spectroscopy components that generate the concentration signals, and the use of the concentration signals by the digital data processor to dispense the agent when the substance concentration is outside a preferred range. It is further augmented by a recitation of the radio receiver for receiving encrypted radio signals and converting them to programming signals for the data processor to enable actuation of selected driver means, the encrypted radio signals originating at a remote location. None of these added components and systems are taught or suggested by the reference, and claim 1 should now be allowable.

Claim 9 depends from claim 1 and has been amended to indicate that the internal radio transmitter emits encrypted radio signals, a feature totally lacking in Avrahami. Thus claim 9 is also allowable. Claim 10 now depends from claim 9, and adds the remote radio transmitter and receiver,

and now specifies that the programming signals are transmitted as encrypted radio signals, and that the remote unit also receives the encrypted radio signals indicative of the concentration of the substance. These features are not found in Avrahami, and claim 10 is also allowable.

Claim 16 has been amended to state that the radio receiver in the patch is adapted to receive encrypted radio signals and convert them to programming signals that are input to the digital data processor. Likewise, claim 17 now depends from claim 16, and again adds that the remote transmitter transmits encrypted signals. As noted before, the reference lacks the encryption facility entirely, and claims 16 and 17 should be allowed.

New claim 18 has been added to capture the use of the invention described in paragraph [0037]. That is, a plurality of patches is provided, each secured to a respective body, and the remote radio transmitter is capable of transmitting encrypted radio signals to all of the patches to activate them at once. This operation is far beyond the scope and apparatus of Avrahami, and claim 18 should also be allowed.

Assuming arguendo that one or more claims now presented is allowable, applicant asserts the right under the terms of the election/restriction requirement to recapture the withdrawn claims by making them dependent on the allowed claim(s).

All claims now presented are believed to be allowable, and all informalities have been rectified. Therefore this application is now in condition for issuance. Action toward that end is earnestly solicited.

Respectfully Submitted,

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